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RESPONSES FROM PRUNING THE BEARING APPLE TREE

F. H. Beach

Extension Professor of Horticulture, Ohio State University

As pruning is an important quality improvement practice, we are interested in how it can be used most effectively with bearing trees. Let us consider the nutrition situation in apple trees as it may be influenced by the kind and amount of pruning. From the soil comes water and the various mineral elements used in food manufacture. These are carried up through the trunk and branch structures through vascular tissues, which, to a considerable degree, are unit structures as far as each branch is concerned. In other words, when a large branch is removed entirely, much of the vascular tissue which carried water and mineral elements into the branch from the root system becomes more or less non-functioning. On the other hand when the pruning consist of removing many small branches and twigs by distributed cuts to leave the most vigorous fruiting wood well spaced, then there is opportunity for a larger dispersal of water and mineral elements into the remaining branches and twigs left on the large limb after pruning. Detail pruning with small cuts well distributed is very useful in giving the remaining fruit spurs a larger supply of water and mineral elements. Accordingly, after such pruning these spurs and terminal growths are more vigorous, fruit setting is improved and fruits grow to larger size and higher color. Because of more and larger leaves and more efficient leaves attached to these individual spurs and terminals, the quality of the fruit is improved and fruit bud formation for next year's crop is encouraged.

Light exposure is very important, as sunlight is the energy used by green leaves in the manufacture of the food utilized wherever growth takes place. Sufficient branch spacing should be done by pruning to allow a relatively uniform distribution of sunlight on the leaves throughout the tree. The amount of branch spacing by large limb removal and the amount of small cuts well distributed should be well coordinated to leave the tree well filled with an efficient fruit spur system.

Distributed pruning increases the water supply to leaves and may considerably increase the time the stomata of the leaves are open to receive carbon dioxide from the air, thus increasing the supply of carbohydrates manufactured. We have experienced several relatively dry seasons in recent years. The invigorating effect of pruning, for these reasons, should be thoroughly appreciated.

Young Bearing Trees.—Before trees begin to bear the main branches have a relatively upright position, the degree depending upon the characteristics of the variety. As the tree comes into bearing, the weight of fruit spreads these limbs outward. Pruning cuts to spread young bearing trees are best deferred until after the amount of spread secured from the weight of crops has been determined. Occasionally, corrective cuts to prevent double leaders, weak crotches, closely parallel large branches and for other reasons, are needed. As the weight of fruit brings down the branches, shading becomes a limiting factor in production, particularly in the lower parts of the tree. Sufficient branch spacing should be given here as necessary to maintain growth and to produce fruit of satisfactory quality in this area. The lower limbs, being the oldest, come into bearing first, and should have a relatively large bearing surface, as long as the quality of fruit produced is satisfactory.

Pruning Older Bearing Trees.—As the quality drops off on the lower branches, the amount of branch spacing in the lower areas is increased by pruning. The amount of detailed pruning is somewhat dependent upon the characteristics of the variety.

Pruning Various Varieties.—We will now consider, in somewhat greater detail, special requirements for the important commercial apple varieties.

Rome: As young Rome trees come into bearing, the tree assumes a more spreading habit under the weight of fruit. Gradually the lower branches become filled with shaded wood and, due to the twiggy growth habit of the fruiting branches, the ends become deeply matted with small twigs unless pruning is properly employed. Hand shears must be used in pruning bearing Rome trees to properly thin out the thick areas at the ends of the fruiting branches. Each large branch is pruned as a unit from the end back to the base, distributing the cuts as well as possible and removing runout and weak wood. It is important that the cuts be well scattered. A common mistake in pruning bearing Rome Beauty trees is to start at the base of a large branch and prune outward, taking off all branches for a considerable distance, leaving a long stretch of naked wood toward the base of the branch, and a cluster of unpruned, bushy twigs at the end of the branch. If the branches are pruned, beginning at the ends and working back to the base with small cuts well scattered, the tree is maintained in a most fruitful condition with bearing wood well distributed. Well pruned bearing Rome Beauty trees need a relatively small amount of hand thinning of the apples during the growing season.

Stayman: On soils and culture that favor strong growth, this variety tends to develop many leggy branches without well placed laterals. Heading back is necessary where legginess occurs, to induce a desirable amount of lateral branching. Stayman is an open grower, requiring a relatively small amount of large branch removals except where corrective cuts, necessary to avoid double leaders or weak crotches, are necessary. This variety is prone to develop many sharp angled, weak forks. Corrective cuts to eliminate these structural weaknesses are important with Stayman. The wood splits easily and large top cuts, used in heading back to laterals, must be made with caution. Frequently water sprouts can be intertwined between weak crotches to make a natural brace and strengthen frame work. Because it is an open grower, lopping shears can be used considerably in the pruning work. High vigor is needed in the fruit spurs of Stayman to improve set and yield. This

variety has serious pollination weaknesses. Small cuts well distributed give a better food supply to the remaining branches and spurs and this type of pruning is, therefore, very important with Stayman. Such pruning may also reduce the amount of growth cracks on the apples in seasons of drouth followed by heavy rains.

Jonathan: The characteristic of Jonathan is to grow many small branches and twigs. Soon after the trees come into bearing, shading develops in the lower part of the tree and branch spacing and detailed pruning is needed there, which is coordinated with the production of high-qualtiy fruit. This variety does not respond well to heading back cuts. Limbs headed back to relatively small laterals are frequently seriously stunted. It is best to confine pruning to branch removal, distributing small cuts on the remaining branches. Pruning is relatively more important than hand thinning of the fruit with Jonathan so that this variety should be given careful, annual winter pruning. Apple thinning experiments with Jonathan have shown a rather narrow margin of actual profit on *well pruned* trees.

Baldwin: If this variety is grown with relatively little pruning, biennial bearing develops rather quickly. The amount of pruning on Baldwin can well be increased soon after trees begin to bear, which will tend to reduce the strong tendency to biennial bearing. As this variety is a strong, dense grower, branch spacing is very important to admit light to the more desirable limbs. The lopping shears can be used to scatter small cuts. Surplus medium-sized branches can be removed with the saw and shears. As this variety tends to over-bear, hand thinning is very important in addition to pruning to improve size, color and quality.

Grimes: A characteristic of Grimes is to bear its fruit relatively deep in the tree so that the small branches and spurs which arise toward the base of the larger limbs are quite important in fruit production with this variety. As trees become dense, the removal of large limbs to secure branch spacing is important. This allows light penetration between the limbs. The excessively heavy areas can be thinned with lopping shears, beginning at the end of the branch and working back to the base. However, it is a great mistake to "cowtail" prune the large branches of Grimes. If the medium-sized limbs and spurs are cleaned entirely off the base of the main branches, yields are reduced, and the most fruitful areas of the tree are largely lost. Grimes responds splendidly to improvement in size and quality from hand thinning. Even on well pruned trees, hand thinning is important as under size is a problem with Grimes.

Delicious: As with Stayman, this variety is subject to weak crotches and growing many branches in whorls. Corrective cuts to space the most desirable main branches is important with this variety. Water sprout bracing can often be used to advantage in bracing up weak structures. Delicious develops too many medium-sized branches and trees become dense unless considerable removal of medium-sized limbs is done with lopping shears and saw. As this variety is most profitable when grown as a large fancy eating apple it is important that branch spacing first be secured to admit sunlight and that this be followed up by well-distributed small cuts. Delicious has a varietal weakness in fruit setting so that detailed pruning with distributed cuts will greatly improve the set of fruit and secure a yield made up of a high percentage of

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BOUNTIFUL RIDGE NURSERIES

PRINCESS ANNE, MARYLAND

large well-colored fruits. Thinning is very important with Delicious as this variety is most profitable when a large percentage of the crop is grown fancy.

Transparent: Transparent grows too many branches and often becomes too dense. It is also a very upright grower as a young tree. Removal of many large branches to a relatively small number of main branches is needed with this variety. When the main branches are properly thinned, the weight of fruit spreads the trees quite satisfactorily. Very little topping to outward growing laterals is needed where the right amount of large branch removal is practiced by pruning. Small cuts, well distributed on branches which are left, help considerably in improving size. This variety also is greatly benefited in years when it sets a full crop by hand thinning early in the season. It is becoming increasingly difficult to sell small Transparents. Both pruning and early season thinning are needed in a relatively high degree to improve size with this variety.

Wealthy: As this is a red variety, the pruning program should never allow the trees to get thick. If Wealthy is allowed to overbear it becomes a weak grower and a biennial cropper. It is important that pruning be done to promote the most vigorous growth. Long terminal growth with all branches should be our aim with Wealthy. Wealthy also responds to tremendous crop improvement by hand thinning which greatly reduces the 2¼-inch fruit and improves the color.

Summary: While we are all interested in a heavy tree or acre yield to secure low bushel cost, it is important that the yield be made up of high quality fruit. Pruning is a practice which definitely improves quality and when properly handled, tends to promote annual bearing. In this connection, it should be inter-related with thinning and other cultural practices.

With well-located trees of desirable varieties, proper pruning is essential if fancy quality is to be produced. Take the opportunity when pruning to mark for removal poor trees and undesirable varieties, or trees in poor locations. If these undesirable trees are further marked by "no pruning" it will be easier to remove them, or topwork them if around fifteen years of age or younger. Better care of our best trees is needed with boarder and submarginal trees eliminated.

Good fruit is the best advertisement a fruit grower can have and proper pruning definitely improves quality.

THE EXPORT SITUATION

"Export Prospects for the 1933-34 Apple Season" (F. S. -A436) published October 18, by the U. S. Bureau of Agricultural Economics, discussed the export market prospects of that time, but some of the general remarks contained in the publication are of interest.

It was stated that a reduced export volume was probable, due to short supply of export-sized, high-quality apples. The world apple crop is smaller than that of last year.

The commercial apple crop of the United States for 1933 was estimated as 82,713,000 bushels, on October 1, crop report, or slightly below the 1932 crop. Of this 45,015,000 bushels were barrelled apples and 37,698,000 bushels

were for the boxed apple crop.

Quality was reported rather poor, and the total pack-out of good fruit was expected to be the smallest on record. The only important apple states reporting larger crops than 1932 were Virginia, West Virginia, Michigan, Idaho, Illinois and California.

The average commercial apple production in the United States for the five-year period, 1927-28 to 1931-32 was 95,200,000 bushels of which 15,800,000 bushels or 16.6% were exported. If we consider the fact that last year (1932-33) the total production was 85,900,000 bushels and that 13,800,000 bushels were exported, we can see that this year's total crop is not a lot larger than the usual part of the crop consumed in this country.

The new Apple and Pear Export Law prevents export of unclassified fruit in barrels or baskets, and of boxed apples below C grade. The Northwestern growers are considering a curtailed movement of C grade for export.

The European apple crop is reported short and of inferior quality, the countries reporting moderate yields and less late apples than usual.

Canada reports an estimated record crop of 13,794,000 bushels, and that means about 2,000,000 more export bushels than last year, mainly to England. This should off-set the short European crop. Generally, however, the Canadian crop does not compete as keenly with American apples as is generally believed. Canadian apples enter England duty free, while American apples have an imposed duty of about one cent a pound, varying with rate of exchange.

Germany offers a fair prospect for export, but there is a limit to amount of foreign exchange for apple imports.

The Netherlands are our third best apple buyers. Their short crop should call for more American fruit. But on August 28 a monopoly was created, whereby fruit can be imported only under special permit and after paying a duty of 10% advalorem, or approximately 15 to 25 cents a box or bushel basket and 45 to 75 cents a barrel, American money. Then there is a fee of 4 Dutch cents per kilo (2.2 pounds) on packed apples and 2 Dutch cents per kilo on unpacked apples. This makes a total fee and duty of about 70 to 80 cents per box or bushel basket and about $2.27 to $2.57 per barrel. This may reduce local demand for American apples, but Holland may still continue as an important trans-shipping center for our fruit, buying it for re-export.

France exports only a moderate crop. Fruit imports are governed by quota and the U. S. quota this year (October to December) is 3,790 metric tons as against 10,155 tons, last year, a reduction of over 60%. This quota may be officially raised by one-third, if need arises. This is an unofficial statement.

Belgium's crop is below average. Last year we sent them 549,000 bushels. Due to high duty on packages of less than 44 pounds, most of the exports to Belgium are barrelled apples. It appears likely that Belgium may take more apples than last year.

The *Scandinavian* countries report good crop prospects, and there may be more competition, but their total crop is not large and is of poor keeping quality, so that the market should be as good as last season. Last year the direct exports to Sweden were 461,000 bushels; Norway, 91,000 bushels; Denmark, 136,000 bushels; Finland, 76,000 bushels. Exports were cut by

strict regulations and restrictions, but goodly amounts of American fruit go to these countries by re-export from other countries which have better trade entries than we have by direct trade.

Poland has a large crop but mostly cider apples. Last year Poland used 20,000 bushels, but took 104,000 bushels the year before. Poor demand and high duties were largely responsible. With no quota and moderated import duties, the exports to Poland should be better this year.

Countries outside of Europe have taken about 7% of the apple exports for the past two years. Shipments to Canada, Latin America, Asia, and other countries totalled 920,000 bushels last year but were 1,200,000 bushels the year before. Prospects are for a better trade with them, this year, Canada excepted.

Rates of exchange, demands, local and world conditions, quotas, tariffs, etc., will of course, have a direct effect upon any predictions made in the above report.

It may be of interest to know where and when we export apples. The following figures are from official records for 1931-32:

Percentage of total exports:

United Kingdom, 41.2; Germany, 21.4; Netherlands, 13.3; France, 7.4; Belgium, 4.0; Sweden, 3.4; Norway, 0.7; Denmark, 1.0 ;Finland, 0.5; Poland and Danzig, 0.1; other Europe, 0.3; total Europe, 9.3.

Canada, 1.1; Mexico, 0.2; Cuba, 0.3; Brazil, 0.9; Argentine, 1.2; Panama, 0.3; Philippines, 0.7; China, 0.2; Hong Kong, 0.3; British India, 0.2; Egypt, 0.2; others, 1.1.

Percentage exports by months:—July, 3.3; August, 3.0; September, 7.9; October, 20.3; November, 21.2; December, 8.3; January, 12.8; February, 10.3; March, 8.9; April, 2.5; May, 1.1; June, 0.4.

VITAMIN C IN THE APPLE

In August, 1933, Maryland Fruit Grower, the vitamin content of various fruits was shown, and it was noted that raw apples contained a fair amount of vitamin A and fair to good amount of vitamins B and C. It will be remembered that vitamin C is a help in scurvy control, and has good effect in control of growth and health of teeth and bone.

A recent reprint from the Journal of Agricultural Research, Vol. 46, No. 11, June, 1933, describes experiments made at Massachusetts Experiment Station in which amounts of vitamin C in Baldwin apples were determined by feeding certain kinds of apple extracts to guinea pigs. The summary of this work is of interest:

"The Baldwin apple grown in Massachusetts is a good source of vitamin C, about 4 g per 300 g of body weight sufficing to maintain growth in guinea pigs and to protect them fully from scurvy.

"In two tests, apples from completely sprayed trees contain as much or possibly more vitamin C than apples from unsprayed trees.

"In 4 to 6 months of storage at 36° F. Baldwin apples lost about 20 per cent of their vitamin C content; in 8 to 10 months the loss was nearly 40 per cent.

"Freshly expressed Baldwin apple juice was found to be nearly as rich

in vitamin C as the fresh apple. Little loss occurred during the first 24 hours after extraction. Benzoated or pasteurized ciders over 40 hours old, however, failed to retain an appreciable quantity of vitamin C.

"Canned Baldwin apple sauce, either strained or unstrained, proved to be a poor source of vitamin C. The unstrained sauce was somewhat superior to the strained."

Aside from vitamin content, we must still bear in mind the beneficial tonic effects of the apple, due to mineral and fruit acid content. These red pills that we are growing on our trees are guaranteed to put a new sparkle in the eye, and to paint your cheeks from the inside.

JAPANESE BEETLE QUARANTINE

Dr. E. N. Cory, State Entomologist has announced that the present Japanese Beetle quarantine limits in Maryland will probably remain as they have been with a possible extension of a small area in the vicinity of Washington, D. C., or even a strip between Baltimore and Washington, and also a small area near Cumberland to allow for road patrol for material entering adjoining states. These extensions have not yet been made, and are under consideration by the U. S. Bureau of Plant Quarantine.

PEACH LEAF CURL SPRAY

This disease is rather easily controlled if spray is *thoroughly* applied before the buds swell. Maryland growers may well apply it after the leaves are off, this fall. There is more time, no rush of other work, and we can pick the more desirable days for spraying. Dormant strength lime-sulfur or 3-3-50 Bordeaux may be used.

COMING MEETINGS

Peninsula Horticultural Society, Berlin, Maryland, December 19 and 20, 1933.

Virginia State Horticultural Society, Luray, Virginia, December 5, 6 and 7, 1933.

Professor (in middle of a joke)—"Have I ever told the class this one before?"

Class (in a chorus)—"Yes."

Professor (proceeding)—"Good. You will probably understand it this time."

Hobo—"Hey, boss, will you give me a dime for a sandwich?"

Gent—"Let's see the sandwich."

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